

# RESERVE COPY PATENT SPECIFICATION

424,360



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## COMPLETE SPECIFICATION.

### Improvements in Electric Safety Cut-outs

I, RICHARD KELLENDORFER, of 60, Lothstrasse, Munich, Germany, a German citizen, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to an electric safety cut-out of the kind wherein the electric current is led through a column of conducting liquid contained together with a gas buffer in a capillary tube the ends of which are closed by electrodes, the liquid being adapted to evaporate under the influence of too large a current and thus cause the column to be ruptured and the circuit to be broken.

The object of the invention is to produce a device of this kind suitable for use in the electric systems of motor vehicles and the like, and the invention consists in providing the electrodes with rough resistance surfaces such as screw threads, wire spirals or the like, adapted to engage frictionally with the liquid to the extent of preventing the conducting column from being ruptured, as well as from being restored after a rupture, by the vibrations of the machine.

Fig. 1 of the accompanying drawings represents a longitudinal section of a device according to the invention on an exaggerated scale and showing its normal condition, and

Fig. 2 is a similar view showing the liquid column ruptured.

The device comprises a transparent, fireproof insulating tube *b* which is flush with two conducting, thimble-shaped end members *c* and enclosed together with the latter within another transparent insulating tube *a*. The latter is hermetically sealed to two terminal caps *e* which bear against the members *c* through the medium of a conducting cushion *d* in the form of springs or mercury fillings which ensure good electric contact under varying degrees of expansion of the surrounding elements. The members *c* constitute the electrodes and enclose, together with the tube *b*, a space which is filled with

a conducting liquid *f*, for instance mercury, and a gas buffer *p*. Under normal conditions the mercury column *f* forms a conducting path between the two electrodes, but in case of a short circuit or overload, evaporation and expansion takes place, and the mercury column *f* will then be ruptured.

The evaporation takes place in the middle of the column where the heating is most intense, and an almost immediate recondensation will occur, but the sudden expansion of the vapour causes one portion of the column to be displaced in the direction of the gas buffer, and the latter will therefore be transferred to the middle of the column, as shown in Fig. 2, so as to break the electric circuit.

The electrodes *c* are internally roughened, for instance formed with a screw thread, or provided with insets in the form of wire spirals as shown in the drawings, so as to act frictionally on the liquid. By this arrangement a rupture of the column *f* under the vibrations of the vehicle will normally be prevented. On the other hand the electrodes will be able to hold the liquid, so that an immediate reclosing of the circuit, which is undesirable, will be prevented. However, a violent shaking or knocking of the device after a rupture of the column will reinstate the latter and restore the conducting property of the device.

An expansion or contraction of the electrodes relative to the tube *a* will be compensated for by the cushion *d*, as shown in an exaggerated manner in the drawings, so as to maintain a good electric connection between the electrodes and the terminal caps.

The bore of the tube *b* and thus the cross-sectional area of the mercury column, is determined by the amount of current the cut-out is intended to carry. The filling of gas and liquid is chosen so as to ensure on the one hand sufficient connection between the electrodes, and on the other hand sufficient compensation space for the developed vapours. If desired, the filling may be coloured the better to show the integrity of the liquid column.

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The thus constructed cut-out will not be detrimentally effected by external influences such as atmospheric conditions, nor by the heating incurred on a breakage of the circuit, and the life of the device and its capability of restoration after overload, will therefore be almost unlimited.

10 Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:

15 1. An electric safety cut-out of the kind referred to wherein the electrodes are provided with rough resistance surfaces such as screw threads, wire spirals or the like adapted to engage friction-

ally with the liquid to the extent of preventing the conducting column from being ruptured, as well as being restored after a rupture, by the vibrations of the machine. 20

2. A device according to claim 1 wherein the tube and the electrodes are flush with each other and enclosed in an outer tube, conducting cushions being provided by means of which the electrodes bear against terminal caps sealed to the ends of the outer tube. 25 30

Dated the 3rd day of November, 1933.

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[This Drawing is a full-size reproduction of the Original.]

Fig. 1

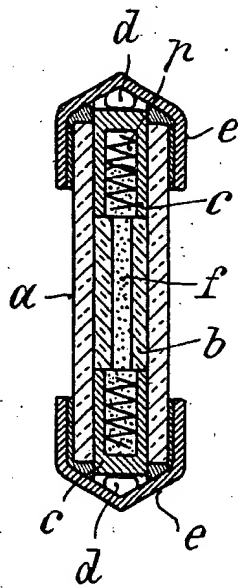


Fig. 2

